the perpendicularity of the light vibrations to the plane of polarisation, by E. Lommel.—On a small alteration of the Bunsen grease-spot photometer, by A. Toepler.—On the refraction of sound-waves, by K. W. Schellbach and E. E. Boehm.—On the specific heat of water according to Dr. Baumgartner's experiments, by L. Pfaundler.—Reply to the observation of O. E. Meyer, by L. Boltzmann.—On the application of the telephone to measurements of resistance, by F. Niemöller.—On the motion of glaciers, by K. R. Koch and F. Klocke.—On hailstones with ice-crystals, by Ed. Hagenbach.—On hailstones of uncommon size, by P. Merion. (In a paper prefixed to this number, Prof. Clausius defends himself against some aspersions, by Herr Dühring, regarding his relations to Robert Mayer, *a propos* of the mechanical theory of heat.)

THE *Sitzungsberichte der naturwissenschaftlichen Gesellschaft Isis in Dresden* (1879, January to June) contain the following papers of interest:—On the recent geographical and geological investigations of the United States of America, by Dr. Geinitz.—On the coal flora of the Lugan coal-pits, by H. Krone.—On the constitution of dichlornitrophenol, by Dr. Schmidt.—On a new form of the influence machine, by Dr. Töpler.—On the action of chloride of lime upon absolute alcohol, by Dr. Goldberg.—On a gas-stove with arrangement for oxidation, by Dr. Hempel —On a new dye, by Dr. Schmitt.—On the isomerism of ethanes, by Dr. Goldberg.—On the tension of threads and Poggendorff's fall machine, by Dr. Amthor.—On a discovery from the later stone period made in Bohemia, by W. Osborne (with 5 plates).—On the prehistoric centres of culture in Schleswig, by Herr Michelsen.—On some objects found by Dr. Schliemann in his excavations in Greece and Asia Minor, by Dr. Fiedler.—On a discovery of urns at the Hradischt, near Stradonic (Bohemia), by W. Osborne.—On the occurrence of *Castanea vesca*, L., by Dr. Friedrich.—Various smaller botanical papers of minor interest.—On the theory of Watts's centrifugal regulator, by Dr. Ritterhaus.—On some galvanometric methods of multiplication, by Dr. Topler.—Remarks on Wallengren's work concerning Linnæus's species of the genus *Phryganea*, by M. Rostock.—On the Neuroptera of Saxony, by the same; a most elaborate treatise with complete list and catalogue.—On the Hemiptera fauna of Transcaucasia, by Dr. von Horvath.—Obituary notices of Dr. Eduard Losche and H. G. Ludwig Reichenbach.

Reale Istituto Lombardo di Scienze e Lettere, vol. xii. fasc. xvii.-xviii.—This number contains a survey of the year's work, announcements of prizes awarded (with abstracts of memoirs), and of prize subjects, &c.

Fasc. xix.—Stratigraphic observations on the precarboniferous formation of Valtellina and Calabria, by S. Taramelli.—On the dilatation of the heart in disorders of the ventricle, by Prof. de Giovanni.

Journal de Physique, December, 1879.—We note here the following:—Measurement of the wave-length of obscure calorific rays, by M. Mouton.—Displacement between oxygen and the halogen elements united with metals, by M. Berthelot.—A spectroscope for studying the phenomena of fluorescence, by M. Lamansky.

Journal of the Franklin Institute, December, 1879.—On a new theory of the retaining wall, by Prof. Du Bois.—A system of electrical storage, by Professors Houston and Thomson.—Steam boiler explosions, by Messrs. Corbin and Goodrich.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 15.—"On Chemical Repulsion," by Edmund J. Mills, D.Sc., F.R.S.

While engaged in some researches on the propagation of chemical change, I have incidentally encountered a new order of phenomena, which the title "chemical repulsion" may serve provisionally to designate. A brief outline of the experiments is given in the following paragraphs.

Upon a glass plate, laid in a horizontal position, is poured enough solution of baric chloride to cover it completely to a considerable depth. On this solution is placed another glass plate, provided with a small central perforation; when the two plates are firmly pressed together with the hands, most of the solution is extruded, and only a very thin layer of it left between the plates. All excess of the solution having been removed from the outer surfaces of the plates as well as from the perforation, some dilute hydric sulphate is now introduced into the perforation. This reagent attacks the baric chloride, throwing down a white precipitate of sulphate; and, proceeding partly by diffusion, partly by flow, does not cease to widen in every direction its figure of advance, until the edges of the plates are attained. If the perforation is circular, the figure of advance is circular; in other words, the chemical development of a circle is a circle.

Let us now suppose the two plates to be square and equal, and let the upper one have two circular perforations, equidistant from the centre of the square, and situated upon its diagonal. Let also two circular developments of baric sulphate be caused to proceed, as before, from the two perforations simultaneously. At first nothing remarkable is observed, but in a short time, the two growing circles begin to exercise a visible retardation on each other's progress; so that the figure of advance is no longer circular, but oval. [This retardation is of course observed only between the perforations; and not outside them, where the motion is entirely free.] As the development of the figures continues, so also does the retardation at their neighbouring edges increase; the final result being (however long the experiment may be prolonged), that the other diagonal of the square is completely and permanently traced out in a line of no chemical action.

The above experiments are of fundamental importance, and they obviously admit of endless variety. Of this, a few illustrations may suffice.

If the upper plate have three perforations, situated on the points of a central equilateral triangle, there are three repulsion lines; these end at the centre of the triangle, where they form a trilocular point, and traverse its sides midway at right angles.

When the upper plate has four perforations, situated on the points of a central square, there are four repulsion lines; these end at the centre of the square, where they form a quadrilocular point, and traverse its sides midway at right angles.

A very beautiful modification of the preceding experiment consists in simultaneously developing a circle from a (fifth) central perforation. This last circle has no means of escape from the surrounding four. The result is, that it eventually forms a square figure bounded by repulsion lines, and having four symmetrically situated repulsion lines at its corners.

It is easy to demonstrate that the chemical repulsion in these experiments does not depend upon flow. Two superimposed triangular plates, for instance, in neither of which is any perforation, give three repulsion lines on immersion in dilute hydric sulphate. From each corner a line proceeds midway (if the triangle be equilateral) to the centre. In this effect diffusion is alone concerned.

In addition to hydric sulphate and baric chloride, other pairs of reagents may be used with success; and I anticipate no difficulty in obtaining results in which precipitation is not concerned. A beginning has also been made with experiments in tridimensional development.

The complete explanation of what I have termed "chemical repulsion" will probably demand a varied and considerable amount of experimental work. From some incidents of the investigation, so far as it has hitherto proceeded, I am disposed to believe that the motion in any plane chemical figure is not along the radius, but at right angles to the radius; and this supposition will, if verified, explain the repulsion. The existing results afford proof of the following propositions, viz.:—(1) *Chemical action can take place at a distance;* and (2) *Two or more chemical actions, identical except in position, completely exclude one another.*

Chemical Society, January 15.—Mr. Warren De La Rue, president, in the chair.—The following papers were read:—On the effects of the growth of plants on the amount of matter removed from the soil by rain, by Dr. J. H. Prevost. Soil 3 inches deep was placed in two glazed earthenware pans 17 inches in diameter on July 21; 4 grm. of white clover seed was sown in one, the other being blank. The pans were exposed till October 4. The drainage-water was collected and analysed; that from the clover soil contained 48·1 grains of solid matter per gallon, the other 220. The author concludes that rain removes much more matter from an uncropped than from a cropped soil.—Mr. Wynter Blyth described a simple apparatus for the treatment of substances in open dishes to volatile solvents. The dish is placed inside a cast-iron pan, and covered with a glass bell-jar, with condenser attached, the joint between the bottom of the pan and the bell-jar being made tight with

mercury.—On dibromanthraquinones, by Mr. W. H. Perkin. By heating bromine with anthraquinone, α dibromanthraquinone is formed, melting at 245° C. ; by boiling tetrabromanthracen with chromic acid, dissolved in a large excess of glacial acetic acid, an isomer β dibromanthraquinone is obtained, melting at 275° C. By the action of caustic alkalies on these bodies, alizarin is formed in both cases. The author discusses the formation of this substance. In the case of the α body, two other colouring matters were formed with the alizarin, one dyeing mordants, the other not. The author is investigating these bodies. He appends a note in which he concludes on further examination that Auerbach's isopurpurin is a mixture of flavopurpurin and anthrapurpurin, and is not identical with anthrapurpurin.—Mr. Warington contributed some notes on some practical points connected with his laboratory experience. He has used with great convenience the indiarubber joint covered with mercury, which was proposed by Dr. Frankland as a substitute for the steel blocks connecting the laboratory and measuring tubes. At first the indiarubber wore out rapidly; this was prevented by tying it above the conical stopper as well as below He recommends the coating of laboratory benches, &c., by heating the wood and then rubbing in paraffin; the wood is thus protected from the action of acids. In the determination of nitrates by Frankland's process, the author suggests the addition of a drop of dilute hydrochloric acid, to ensure a complete reaction between the mercury and the nitric acid. By means of a solution of diphenylamine in strong sulphuric acid, the author has detected by the blue coloration produced $\frac{1}{10000}$th of a milligram of hydrogen as nitric acid.—On the melting and boiling points of certain inorganic substances, by T. Carnelly and W. C. Williams.

Zoological Society, January 6.—Prof. Flower, F.R.S., president, in the chair.—Prof. Newton, M.A., F.R.S., V.P., exhibited, on behalf of Mr. G. B. Corbin, a specimen of *Acanthyllis* (sive) *Chætura caudacuta*, the Needle-Tailed Swift, shot near Ringwood, in Hampshire, in July, 1879, remarking that it was the second example of this Siberian species which had been obtained in England.—Mr. John Henry Steel, F.Z.S., read a series of preliminary notes on the individual variations observed in the osteological and myological structure of the Domestic Ass (*Equus asinus*).—A communication was read from Mr. E. W. White, C.M.Z.S., containing notes on the distribution and habits of *Chlamyphorus truncatus*, from observations made by the author during a recent excursion into the western provinces of the Argentine Republic, undertaken for the purpose of obtaining a better knowledge of this animal.—Dr. John Mulvany, R.N., read a paper on a case which seemed to him to indicate the moulting of the horny beak in a Penguin of the genus *Endyptes*.—Mr. O. Thomas, F.Z.S., read the description of a new species of *Mus*, obtained from the island of Ovalau, Fiji, by Baron A. von Hügel, and proposed to be called *Mus huegeli* after its discoverer.—A communication was read from Mr. R. G. Wardlaw Ramsay, F.Z.S., containing a report on a collection of birds made by Herr Bock, a naturalist employed by the late Lord Tweeddale, in the neighbourhood of Padang. Three species were described as new and proposed to be called *Dicrurus sumatranus*, *Turdinus marmoratus*, and *Myiophoneus castaneus*.—Dr. Günther, F.R.S., read a description of two new species of Antelopes, of the genus *Neotragus*, *N. kirki*, from Eastern Africa, and *N. molaris*, from Damaraland.

Geological Society, January 7.—Henry Clifton Sorby, president, in the chair.—Edward Bagnall Poulton was elected a Fellow, and Prof. A. E. Nordenskjold, Stockholm, and Prof. F. Zirkel, Leipzig, Foreign Members of the Society.—The following communications were read:—On the Portland rocks of England, by the Rev. J. F. Blake, F.G.S. The author gave a general account of the relation of the several Portland rocks in the areas of their development to each other, and hence deduced the history of the Portland "episode." The name is used on the Continent in a wider sense than in England, and this use was shown to be unjustifiable. After giving an account of his observations on the rocks at Portland itself, and dividing the limestones into the building-stone and flinty series, the author showed that the so-called "Upper Portlandian" of Boulogne corresponds to the latter, and the upper part of the "Middle Portlandian" to the Portland sand. He then endeavoured to prove, by the proportionate thickness, the indications of change in the lithology, and the distribution of some of the fossils, that the rest of the so-called "Middle" and the "Lower Portlandian" are represented by integral portions of the Upper Kimmeridge, which are thus the "normal" form corresponding to what the author calls the "Boulognian episode." The series in the Vale of Wardour has been made out pretty completely. The Purbeck is separated by a band of clay from the Portland, and is not amalgamated with it. The building-stones and flinty series are here seen again; and a fine freestone occurs at the base of the latter. The representatives of the Portland sand were considered to be older than those of other districts. The relations of the Purbeck to the Portland rocks at Swindon were very carefully traced; and it is shown that, while the upper beds of the latter put on here some peculiar characters, the former lie on their worn edges. The upper beds of the Portland, which have been referred to the sand, correspond to the freestone and the base of the flinty series of the Vale of Wardour; hence the Purbecks of Swindon may be coeval with the upper beds of the Portland to the south. At the base of the great quarry and elsewhere in the neighbourhood are the "*Trigonia*-beds," beneath which is clay, hitherto mistaken for the Kimmeridge clay; and beneath this are the true Portland sands, with an abundant fauna new to England. The limestones of Oxfordshire and Bucks were considered to represent the "*Trigonia*-beds" only; and, as the Purbecks here lie for the most part conformably, it was suggested that they were formed in a lake at an earlier period than those at Swindon, which are of a more fluviatile character. Hence the Portland episode, considered as marine, was at an end in the north before it was half completed in the south.—On the correlation of the drift-deposits of the north-west of England with those of the midland and eastern counties, by D. Mackintosh, F.G.S.

Anthropological Institute, Jan. 13.—John Evans, D.C.L., F.R.S., vice-president, in the chair.—Dr. Hack Tuke read a paper on "The Cagots." The author showed that the popular etymology of the word Cagot, from "Canis Gothi," is probably inaccurate, and accepted the suggestion of M. de Rochas, that Cagot is derived from the Celto-Breton word *cacod* (leprous); it is easy to see how readily this would assume the form of cacou (as it is in Brittany actually applied to these people), and so the French Cagou or Cagot. The conclusions at which the author arrived as to the origin of the Cagots were as follows:—1. The Cagots are not the descendants of the Goths; they are not a distinct race, but a despised class among the people of the country in which they live. 2. They are not more subject to goitre or to cretinism than the inhabitants of the adjacent district—in short, cagotism and cretinism are in no way allied. 3. The present representatives of the Cagots are now recognised by tradition, and not by their features, and are not distinguished by any peculiar mental or physical disorder. 4. Although nothing like leprosy, or leucoderma, has for a long time affected the Cagots, and no one on the spot regards them in this light, there is evidence to show that they were originally either lepers labouring under a particular variety of leprosy, or were affected with leucoderma, the form of the affection accounting for their being regarded as in some respects different from ordinary lepers, though shunned in the same way. 5. Many were, no doubt, falsely suspected of leprosy in consequence of some slight skin affection; others, again, in later centuries, were members of families in which the disease had died out.—The Director read two papers by Mr. Alfred Simson, on the Jivaros and the Canelos Indians. The tribe of the Jivaros is a large one, and one of the most distinguished, independent, and warlike in South America. They speak a language of their own, Jivaro, and occupy the country generally from the Upper Pastassa to the Santiago, both rivers included, down to the Pongo de Manseriche, on the Marañon. They are hospitable, and their houses are large and built of palms. They have a most perfect method of scalping, by which the victim's head is reduced to the size of a moderately large orange, maintaining tolerably well all the features: the skin is cut round the base of the neck, and the entire covering of the skull removed in one piece. This is then dried gradually by means of hot stones placed inside it, until the boneless head shrinks to the required size. They also wear their slain enemies' hair in long plaits round the waist. Great festivities take place when a child, at three or four years of age, is initiated into the art and mysteries of smoking. The Jivaros of the Pintue have the habit of vomiting nearly every morning by the aid of a feather, arguing that all food remaining in the stomach overnight is unwholesome and undigested, and should therefore be ejected. Canelos, the once attractive Spanish settlement, but now forlorn Indian village, is situated on the left bank of the Bobonaza, one of the most important, if not the largest, of the

tributaries of the Upper Pastassa, and is inhabited by a mixed tribe of Indians in whom the chief element is Jivaro, though some of the better traits of these seem to be wanting in them. Their language is Quichua. Their fighting is done entirely with the lance, which is their inseparable companion, and all the author's attempts to induce any of them to part with his weapon were fruitless.

PARIS

Academy of Sciences, January 12.—M. Edm. Becquerel in the chair.—M. Daubree presented the second part of his Synthetic studies of experimental geology; it treats chiefly of the chemical and mechanical phenomena of meteorites (which are compared with the deeper rocks).—On meteorological observations in May at Zi-ka-wei, in China, by M. Faye. Storms go from China to Japan, following a like course to that of storms coming to Europe from the Atlantic. They are independent of the prevailing monsoon, and conversely, neither preventing the other. M. Faye finds support for the theory of gyratory movements propagated downwards.—On the kinematic geometry of deformations of bodies, elastic, plastic, or fluids, by M. De Saint Venant.—Some observations on a note of M. Wurtz (*C. R.*, December 22, 1879), by M. Sainte-Claire Deville.—Evolution of the inflorescence in Gramineæ (first part), by M. Trecul. He considers here (1) the formation of the primary axis; (2) the order of appearance of the branches; (3) that of their growth.—Influence of the nature of carbons on the electric light, by M. Du Moncel. In 1855 he called attention to the advantages of using carbons of *vegetable origin* for the electric light. In 1859 he produced an electric candle with plates of charcoal in a tube.—On the disaccord apparent between the heights recently observed on the Seine and the previsions of the hydrometric service in the passage through Paris, by MM. Lalanne and Lemoine. M. Belgrand's empirical laws apply only to the natural state of the river, but ceased to apply in the early days of January, owing to the effects of the abnormal freezing of the Seine (which occurs several times in a century). M. Dumas and Gen. Morin made some remarks, the General pointing out that the breaking up of the ice sometimes proceeds up the river, sometimes down; in the latter and more dangerous case explosives and other means should be promptly used to open the block.—On the photographic spectra of stars, by Dr. Huggins.—State of the tunnelling operations of St. Gothard, by M. Colladon. The works have been retarded. From November 11 to January 1 (fifty-one days) the advance of the north gallery was only 34·90 m against 173·10 m. in the forty-nine days previous. This was due to pressure of an unresistant rock met with, which crushed the strongest wood-work. The perforation will likely be complete in the end of February or beginning of March.—On treatment of phylloxerised vines, by M. Marès.—On glycogenesis in infusoria, by M. Certes. Treated with iodised serum, they present similar effects to those whereby M. Ranvier, with this substance, proved the presence of glycogen in lymphatic cells. (The effects on several organisms found with infusoria are also indicated.) The vitality of animalcules is an important factor in glycogenesis.—Resistance of pucerons to severe cold, by M. Lichtenstein. Phylloxera and others successfully resisted cold of 11° and 12° below zero in December.—Determination, by M. Gylden's methods, of the motion of the planet Hera (103), by M. Callandreau.—On the polygons inscribed in a conic, and circumscribed on another conic, by M. Darboux.—Solar cyclone, by M. Thollon. Observing a peculiarly dark spot on January 3, he perceived two opposite deflections of the line C, corresponding to velocities of 60 and 137 km. respectively, in the vast cyclone.—On the thermal laws of the electric sparks produced by ordinary partial discharges of condensers (second note), by M. Villari. The galvanometric deflections caused by incomplete discharges are proportional to the quantities of electricity forming the discharges. The heat generated by the spark is directly proportional to the quantity of electricity forming the spark.—Variations of the magnetic declination deduced from regular observations at Montcalieri in the period 1871–78, by M. Denza. These agree in the main with observations at other Italian places, and at Prague, Christiania, Munich, and Greenwich, pointing to cosmical causes.—On the Thomson galvanometer, by M. Gaiffe. The scale-indications are not proportional to the values of the currents measured, the angles of deflection of the needle being doubled by reflection of the mirror. This source of error he seeks to correct by using a bifilar suspension formed of two cocoon-fibres.—On the potash contained in the clay of arable soils, by M. Perrey. Clay constantly contains potash varying ordinarily from 2 to 5 per cent., sometimes from 1·8 to 7·3 per cent.—On the tension of dissociation of hydrate of chloral, and on the vapour tension of anhydrous chloral, by MM. Moitessier and Engel.—Effects of intra-venous injections of sugar and gum, by MM. Moutard-Martin and Richet. Sugar injected into dog's veins always cause polyuria and glycosuria, and does not affect the blood-pressure. Gum has an opposite effect; it diminishes the polyuria previously produced by sugar, and at length completely stops the secretion of urine; it also increases notably the tension of blood in the arteries.—On the phenomena arising from ligature of the inferior vena cava above the liver, by M. Picard.

VIENNA

Imperial Academy of Sciences, October 23, 1879.—The earthquakes of Carinthia and their lines of shock, by Prof. Hoefer.—On the histiogenesis of sclerosis of the posterior fibres of the spinal cord, by Dr. Weiss.—On the forces operative on diamagnets, by Prof. Bolzmann.—Determination of path of the planet Bertha (154) by Herr Anton.

November 6, 1879.—The long-haired common guinea-pig (*Cavia Cobaya longipilis*), by Dr. Fitzinger.—Fish-fauna of the Cauca and the rivers in Guayaquil, by Dr. Steindachner.—Shell-fish fauna of the Galapagos Islands, by Herr Wimmer.—The von Muller collection of Australian fish, by Dr. Klunzinger.—On the humour passages of hyaline cartilage, by Dr. Spina.—Magnetic measurements in Kremsmünster in July, 1879, by Herr Liznar.—On compounds from animal tar: III. Lutidine, by Prof. Barth and Herr Herzig.

November 13, 1879.—Researches on the development of the central nerve-tissue, by Herr Stricker and Dr. Unger.—On the action of the safety-valve in steam boilers, by Herr von Burg.—Firing under water, by Herr Lorber.

November 20, 1879.—The following among other papers were read:—The sporogon of Archidium, by Prof. Leitgeb.—Contributions to a knowledge of the hen's germ at the commencement of brooding, by Herr Koller.—On the last multiplier of differential equations of higher order, by Prof. Winckler.

December 4, 1879.—On the striction line of the hyperboloid as rational space-curve of fourth order, by Herr Migotti.—On processes of degeneration and regeneration in uninjured peripheric nerves, by Prof. Mayer.

December 11, 1879.—On waterspouts observed near Canea, by Herr Miksche.—Researches on the course of conduction in the spinal cord of the dog, by Dr. Weiss.—A contribution to the theory of urine-secretion, by Dr. Gärtner.—On a new isomer of gluconic acid, by Herr Hönig.—On the theory of inconstant galvanic elements, by Prof. Exner.

CONTENTS